REMARKS

Claims 1-57 remain pending in the present application. Reconsideration and allowance for all of the claims in the present application are earnestly solicited in view of the following remarks.

Claims 1, 3, 4, 10, 11, 15, 17-19, 24, 30, 32, 33, 37, 39, 40, 45, 48, 49 and 52 stand rejected under 35 U.S.C. §103(a) as being unpatetable over U.S. Patent No. 5,751,002 to Ogata et al. in view of U.S. Patent No. 6,242,750 to Takahashi et al. This rejection is respectfully traversed.

Independent claims 1, 30 and 45 are directed to ion implanters and methods for implanting ions by generating an ion beam, separating unwanted components from the ion beam by an analyzer and transporting the ion beam through an analyzer at a first transport energy. The ion beam is decelerated to a final energy that is lower than said first transport energy at a portion downstream from the analyzer. Thereafter, neutral particles are separated from the ion beam before the ion beam is delivered to a target site at a final lower energy. Independent claims 15, 37 and 52 are directed to ion implanters and methods for implanting ions by a double deceleration mode of operation. In these claims, the first deceleration stage decelerates the ion beam to a second transport energy less than said first transport energy and then separates the neutral particles from the ion beam and transports the ion beam through the beam filter similar to the implanters and methods as recited in claims 1, 30 and 45. However in these embodiments, the ion beam is decelerated a second time before reaching the final energy that is less than the second transport energy before reaching the target.

The claimed implanters and methods allow the ion beam to be transported at a high energy throughout a substantial portion of the implanter so that beam expansion is minimized. After this high energy transporting portion, the ion beam is then decelerated to the desired low energy for implant and received at the target so that the beamline length over which the low energy ions are transported is shortened. In the double deceleration mode as recited in claims 15, 37 and 52, the ion beam is transported through the beam filter at a higher energy during the initial transport portion before being decelerated a second time to the final energy just before

being implanted into the target. In these double deceleration embodiments, the beam is delivered to the target at higher currents because beam expansion is reduced through the beam filter.

Ogata et al. is relied upon to disclose an ion implantation apparatus comprising an ion source 1, a mass analyzer 2, quadru-pole electro-magnets 11 and 12, an electrode assemblies 5 and 8, a deflection electro-magnet 6, and a target substrate 10. The electrode assembly 5 includes electrodes 5a, 5b, and 5c interposed between insulators I. As acknowledged in this rejection, Ogata et al. does not disclose a deceleration stage positioned downstream of the analyzer for decelerating the ion beam from the first transport energy to a final energy lower than the first transport energy. Takahashi et al. is relied upon to disclose an ion implantation device including an ion source 2, a mass analyzer magnet 6, a beam guide 7, and electrode apertures 10, 11 and 12. The electrode apertures 10, 11 and 12 provide the deceleration and convergence effects so that a large current of a low energy beam can be implanted into a wafer.

In contrast to Takahashi et al., the ion implanters and methods recited in the claims of the present invention transport the ion beam at a first transport energy through the initial portion of the implanter and the energy of the ion beam is decelerated before being implanted into the target with a final energy lower than said first transport energy. Beams are often transported to the vicinity of a wafer at higher energies and then decelerated to a final energy by a retarding electric field to overcome beam expansion problems. However, ions neutralized prior to entering the retarding field region impact the wafer with the transport energy and neutralized ions are implanted into the wafer which adversely affect the resulting device. The ion implanters and methods recited in the claims of the present application prevent neutralized ions from being deflected and reaching the wafer by utilizing the different first and second transport energies as claimed in the present application so that such ions do not contaminate the wafer or workpiece during processing. Such features are not suggested or implied by the combination of Ogata et al. and Takahashi et al. Accordingly, it is respectfully submitted that independent claims 1, 15, 30, 37, 45 and 52 and their respective dependent claims 3, 4, 10, 11, 17-19, 24, 25, 30, 32, 33, 39, 40, 45, 48 and 49 patentably define over the combination of Ogata et al. Takahashi et al. and it is respectfully requested that this rejection be reconsidered and withdrawn.

Claims 5, 13, 14, 20, 27-29, 34, 41, 42, 46, 47 and 53-55 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 5,399,871 to Ito et al., claims 2, 6, 16, 31 and 38 stand rejected under 35 U.S.C.

§103(a) as being unpatentable over Ogata et al. in view of Takahasi et al. in further view of Ito et al. in further view of U.S. Patent No. 5,747,936 to Harrison et al., claims 7, 8, 12, 21, 22, 26, 35, 43, 50 and 56 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 4,276,477 to Enge et al., and claims 9, 23, 36, 44, 51 and 57 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 5,343,047 to Ono et al. These rejections are respectfully traversed.

Dependent claims 2, 5-9, 12-14, 16, 20-23, 26-29, 31, 34-36, 38, 41-44, 46, 47, 50, 51 and 53-57 recite further embodiments of the present invention based on their respective independent claims 1, 15, 30, 37, 45 and 52. Ito et al., Harrison et al., Enge et al. and Ono et al fail to cure the deficiencies of Ogata et al. as discussed in the rejection above and it is respectfully submitted that these dependent claims patentably define over the combinations of Ogata et al. with Ito et al., Harrison et al., Enge et al. and Ono et al. for at least the reasons in the base rejection. Accordingly, it is respectfully requested that these rejections be reconsidered and withdrawn.

For all of the above stated reasons, it is respectfully submitted that all of the outstanding rejections have been overcome. Accordingly, it is requested that claims 1-57 of the present application be passed to issue.

If any issues remain unresolved, the Examiner is requested to telephone the undersigned attorney.

Please charge any additional fees or credit any overpayments to deposit account No. 50-0896.

Respectfully submitted,
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